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Rubber building gaskets — Materials for preformed solid vulcanized structural gaskets — Specification

Profilés en caoutchouc pour le bâtiment — Matériaux pour profilés de structure compacts préformés vulcanisés — Spécifications

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 4, *Products (other than hoses)*.

This third edition cancels and replaces the second edition (ISO 5892:2013), which has been technically revised.

The main change is as follows: lifetime estimation has been added as an optional requirement in Clause 9.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Rubber building gaskets — Materials for preformed solid vulcanized structural gaskets — Specification

1 Scope

This document specifies the material requirements for preformed, solid vulcanized rubber structural gaskets in sealing and supporting applications for buildings.

NOTE Specifications for non-supporting gaskets are given in ISO 3934.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 37, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*

ISO 48-4, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 4: Indentation hardness by durometer method (Shore hardness)*

ISO 188:2023, *Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests*

ISO 812:2017, *Rubber, vulcanized or thermoplastic — Determination of low-temperature brittleness*

ISO 815-1, *Rubber, vulcanized or thermoplastic — Determination of compression set — Part 1: At ambient or elevated temperatures*

ISO 815-2, *Rubber, vulcanized or thermoplastic — Determination of compression set — Part 2: At low temperatures*

ISO 1382, *Rubber — Vocabulary*

ISO 1431-1, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 1: Static and dynamic strain testing*

ISO 3302-1, *Rubber — Tolerances for products — Part 1: Dimensional tolerances*

ISO 3384-1:2024, *Rubber, vulcanized or thermoplastic — Determination of stress relaxation in compression — Part 1: Testing at constant temperature*

ISO 11346, *Rubber, vulcanized or thermoplastic — Estimation of life-time and maximum temperature of use*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1382 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
structural gasket
building *gasket* (3.2) that directly supports glass substrates, etc. and makes components watertight and airtight

Note 1 to entry: A structural gasket consists of gaskets and *lock strips* (3.3).

3.2
gasket
component with channels which support both glasses and support frames

Note 1 to entry: A gasket that has two channels is called a double-channel gasket and a gasket that has one channel is called a single-channel gasket.

3.3
lock strip
component that is inserted into the lock-strip cavities for ensuring the required watertightness and airtightness

3.4
working temperature
temperature range where the *gasket* (3.2) is intended to be used

4 Types of material

Two types of materials are specified. Type E, with a nominal hardness of 75 Shore A, is intended for gaskets and the lock strip. Type F, with a nominal hardness of 85 Shore A, is intended only for the lock strip.

5 Working temperature range

The working temperature ranges of gaskets are divided into the following categories:

a) T_1: temperature of gasket: −20 °C to +55 °C;

b) T_2: temperature of gasket: −20 °C to +85 °C;

c) T_3: temperature of gasket: −40 °C to +70 °C;

d) T_4: temperature of gasket: −40 °C to +100 °C.

6 Material and workmanship

6.1 Gaskets shall be made from ozone-resistant rubber and shall not depend for ozone resistance solely on surface protection which can be removed by abrasion, detergents or other means.

6.2 Gaskets shall be free from porosity, significant surface defects and dimensional irregularities, particularly on the sealing faces.

7 Dimensions and tolerances

Dimensions and tolerances shall be the subject of agreement between the interested parties. Tolerances shall be in accordance with the specifications of ISO 3302-1.

8 General requirements

8.1 Test pieces

Test pieces shall be cut from the finished product. If they cannot be so prepared, they shall be taken from moulded test slabs of suitable dimensions made from the same batch of material used for the gaskets and vulcanized under conditions which are comparable with the conditions used in production.

8.2 Hardness

When tested in accordance with the method specified in ISO 48-4, the hardness shall comply with the requirements of Table 2.

8.3 Tensile strength and elongation at break

When tested in accordance with the method specified in ISO 37 using a dumbbell test piece, the tensile strength and elongation at break shall comply with the requirements of Table 2.

8.4 Compression set

8.4.1 Compression set at elevated temperatures

When tested in accordance with the method specified in ISO 815-1, the compression set shall comply with the requirements of Table 2 after 24 h at 100 °C. Test specimen B shall be used.

8.4.2 Compression set at low temperatures

When tested in accordance with the method specified in ISO 815-2, the median value of type E compression set after recovery periods of 30 min shall be 60 % or less after 24 h at −20 °C for T_1 and T_2 or −40 °C for T_3 and T_4.

The median value of type F compression set after recovery periods of 30 min shall be 70 % or less after 24 h at −20 °C for T_1 and T_2 or −40 °C for T_3 and T_4.

8.5 Accelerated ageing

After the test pieces have been aged in accordance with ISO 188:2023, method A and the conditions specified in Table 1, the change in hardness, tensile strength and elongation at break shall comply with the requirements of Table 2.

Table 1 — Accelerated ageing test conditions

Working temperature range	Test temperature °C	Test time d
T_1	70	14
T_2	100	
T_3	85	
T_4	115	

8.6 Ozone resistance

When tested in accordance with the method specified in ISO 1431-1, test pieces shall show no cracks after 96 h at 40 °C, under 20 % elongation, at an ozone concentration of (500 ± 50) ppb or (50 ± 5) pphm.

NOTE Parts of ozone per billion of air by volume (ppb) is used in environmental science for atmospheric pollutants, while parts per hundred million (pphm) has been the traditional unit for ozone concentration in the rubber industry. The ozone concentration can also be expressed in mg/m^3 or in mPa. The expression mg/m^3 indicates the number of ozone molecules in the volume which is available for ozone cracking and depends on both pressure and temperature. ISO 1431-3 contains a formula for conversion.

8.7 Summary of property requirements

Table 2 summarizes the requirements on the properties in 8.2 to 8.7. Table 4 lists additional optional requirements.

Table 2 — Property requirements

Property	Unit	Limit		Document specifying test method
		Type E	Type F	
Hardness	Shore A	75 ± 5	85 ± 5	ISO 48-4
Tensile strength, min.	MPa	12	12	ISO 37
Elongation at break, min.	%	175	125	ISO 37
Compression set, after 24 h at 100 °C, max.	%	35	35	ISO 815-1
Ozone resistance (500 ± 50) ppb or (50 ± 5) pphm elongation 20 %; duration 96 h at 40 °C	—	No cracking	No cracking	ISO 1431-1
Maximum change from unaged values after ageing under conditions specified in Table 1:				
a) hardness	Shore A	+10 to 0	+10 to 0	ISO 188:2023, method A and ISO 48-4
b) tensile strength	%	−15	−15	ISO 188:2023, method A and ISO 37
c) elongation at break	%	−40	−40	ISO 188:2023, method A and ISO 37
Low-temperature compression set, after 24 h at for T_1 and T_2 −20 °C for T_3 and T_4 −40 °C Median value after recovery period of 30 min	%	60 % or less	70 % or less	ISO 815-2

9 Optional requirements and recommendations

9.1 General

The requirements and recommendations in 9.2 to 9.8 are optional and are summarized in Table 4. Requirements, recommendations and corresponding test methods shall be subject to agreement between the interested parties.

9.2 High-ozone resistance

When tested in accordance with the method specified in ISO 1431-1, the test pieces shall not show any cracks after 96 h at 40 °C, under 20 % elongation, at an ozone concentration of (1 000 ± 100) ppb or (100 ± 10) pphm.

9.3 Holding force

The holding force should be measured according to the method described in Annex A. This method is given as an example. Details of the procedure and requirements depend on the profile of the gasket and shall be the subject to agreement between the interested parties.

9.4 Watertightness

A suitable test method is described in ISO 15821.

9.5 Flammability

National regulations can apply to the structure of which the test piece is a part with regards to the material's flammability.

9.6 Contact and migration staining

A suitable test method is described in ISO 3865.

9.7 Low-temperature brittleness

When tested in accordance with the method specified in ISO 812:2017, procedure C, no failure shall be observed in any one of the test pieces at the lowest temperature in thermal conditions of use.

9.8 Lifetime estimation

9.8.1 General

The lifetime estimation tests described in 9.8.2 and 9.8.3 are performed on a material or on standard test samples prepared out of the final product, not on a finished product in a real system. The result of the lifetime estimation can be used to compare different materials for the same application. For a seal in a real application, there are many other factors affecting the lifetime and the performance of the seal. See Annex B.

Suitable lifetime estimation temperatures shall be chosen from Table 3 and suitable test temperatures shall be chosen in accordance with ISO 11346.

Table 3 — Temperatures used for lifetime estimation

Working temperature range	Lifetime estimation temperature °C
T_1	39
T_2	55
T_3	47
T_4	63

9.8.2 Method 1 by stress relaxation

The stress relaxation shall be determined with ISO 3384-1:2024, method A or method B using the cylindrical test piece after carrying out thermal and mechanical conditioning.

Measurements shall be done at three temperatures to the threshold value of 50 % stress relaxation for method A and 75 % for method B. The times to reach the threshold value in percentage at each temperature is plotted in an Arrhenius plot according to ISO 11346. The lifetime is determined by extrapolating the line to the lifetime estimation temperature in Table 3.

9.8.3 Method 2 by compression set

The compression set shall be determined with ISO 815-1:2019, method A, using the small type B test piece.

Measurements shall be done at three temperatures to the threshold value of 80 % compression set. The times to reach 80 % at each temperature is plotted in an Arrhenius plot according to ISO 11346. The lifetime is determined by extrapolating the line to the lifetime estimation temperature in Table 3.

9.8.4 Summary of optional property requirements

Table 2 lists the property requirements. Table 4 lists additional optional property requirements and recommendations.

Table 4 — Optional property requirements

Property	Unit	Limit		Document specifying test method
		Type E	Type F	
High-ozone resistance (1 000 ± 100) ppb or (100 ± 10) pphm elongation 20 %; duration 96 h at 40 °C	—	No cracking		ISO 1431-1
Holding force	N/m	Agreement between interested parties		Annex A
Watertightness	—	Agreement between interested parties		ISO 15821
Contact and migration staining	—	Agreement between interested parties		ISO 3865
Low-temperature brittleness	°C	Lowest temperature in thermal conditions of use or below		ISO 812:2017, procedure C
Estimation of lifetime years at the temperature in Table 3	years	50	50	ISO 11346

Annex A
(informative)

Holding force test

A.1 Principle

This test method determines the force exerted by the gaskets to hold glass, etc. It simulates actual use conditions by applying a load to the pressure plate, which is a simulated glass. In the case of double-channel gaskets, place the test pieces between the pressure plate and support frames with thickness equal to that of the articles. In the case of single-channel gaskets, attach the pressure plate and test pieces to the reglets and support frames. Thus, these measurements reflect the wind pressure that would be encountered during application.

A.2 Apparatus

A.2.1 The testing machine shall be a power-driven tensile testing machine of the movable crosshead type, equipped with adjustable crosshead speed control, a suitable dynamometer, and an indicating or recording device for measuring the applied force with an accuracy of ±2 % of the full-scale reading.

A.2.2 The pressure plate and support frames to be used with the testing machine shall be of a type similar to those shown in Figures A.1 and A.2. The thickness of the support frames and the groove dimensions of the reglets shall be subject to actual use conditions.

A.2.3 The pressure plate and support frames shall be made of steel. The reglets shall be made of steel or a material equivalent to that of the actual reglets. Their length shall be at least 100 mm.

A.3 Test piece

A.3.1 The extruded test pieces shall be at least 50 mm long but no longer than the pressure plate, support frames and reglets.

A.3.2 A minimum of eight test pieces from each lot shall be tested.

A.4 Procedure

A.4.1 Place the test pieces in the support frames as shown in Figures A.1 or A.2. The clearance at this time shall be the subject of agreement between the interested parties. The test shall be conducted at a standard laboratory temperature.

A.4.2 Strain the pressure plate at a straining speed of 10 mm/min until the pressure plate or the gaskets come out of the reglets or support frames.

A.4.3 Read the maximum load from the automatic recording.

A.4.4 Repeat the operations in A.4.1 to A.4.3 until two sets of test pieces have been tested.

A.4.5 Change the loading direction to simulate the wind pressure from the outside and the inside of the chamber under actual use conditions. Repeat the operations in A.4.1 to A.4.3 until two sets of test pieces have been tested.

A.4.6 The holding force, W_P, is given by Formula (A.1):

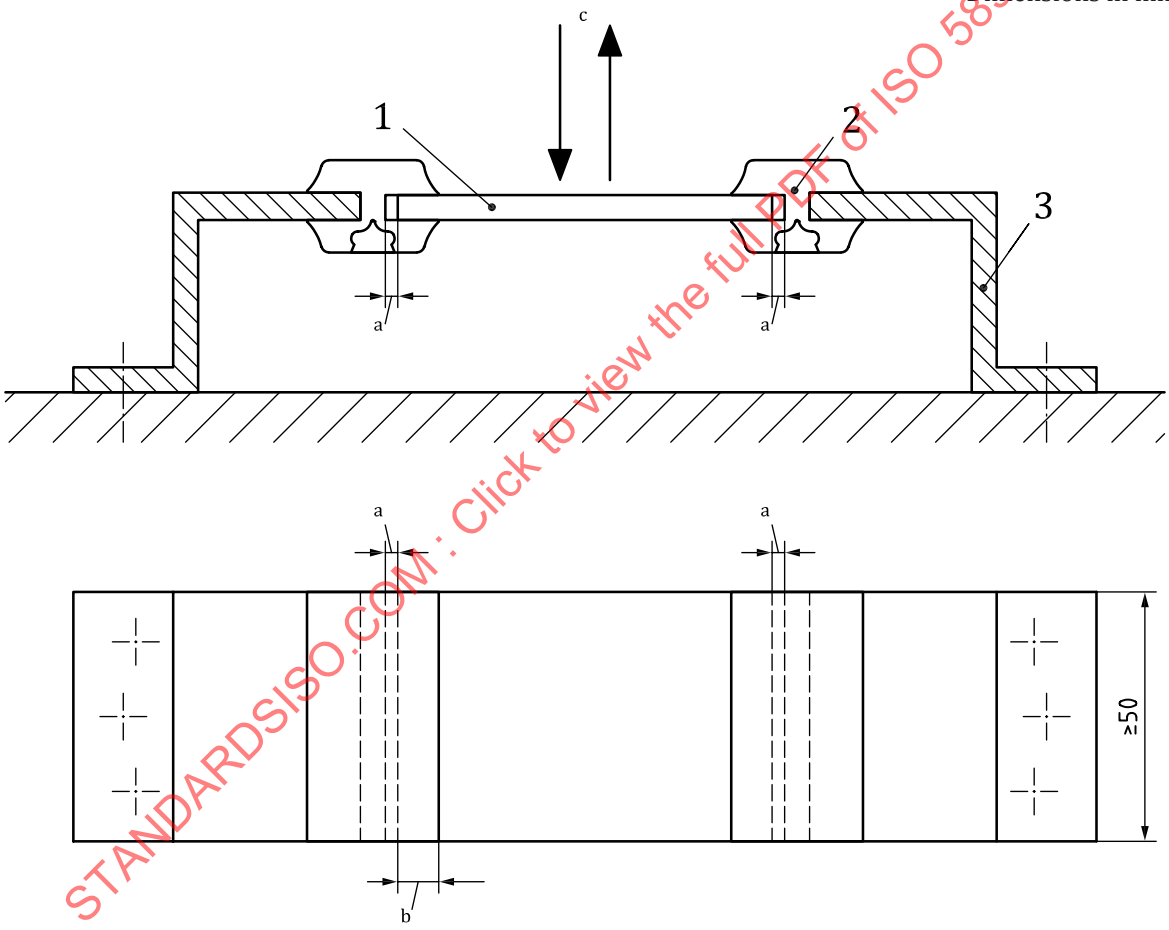
$$W_P = \frac{W}{L} \tag{A.1}$$

where

W is the maximum load, expressed in newtons;

L is the sum of length of specimens, expressed in millimetres.

Dimensions in millimetres



Key

1 pressure plate
2 H-shaped gasket
3 support frame
a Clearance.
b Bearing width.
c Load.

Figure A.1 — Example of a setup for a double-channel gasket